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### Related U.S. Application Data

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See application file for complete search history.

(57) **ABSTRACT**

A system and method employing at least one semiconductor device, or an arrangement of insulating and metal layers, having at least one detecting region which can include, for example, a recess or opening therein, for detecting a charge representative of a component of a polymer, such as a nucleic acid strand proximate to the detecting region, and a method for manufacturing such a semiconductor device. The system and method can thus be used for sequencing individual nucleotides or bases of ribonucleic acid (RNA) or deoxyribonucleic acid (DNA). The semiconductor device includes at least two doped regions, such as two n-typed regions implanted in a p-typed semiconductor layer or two p-typed regions implanted in an n-typed semiconductor layer. The detecting region permits a current to pass between the two doped regions in response to the presence of the component of the polymer, such as a base of a DNA or RNA strand. The current has characteristics representative of the component of the polymer, such as characteristics representative of the detected base of the DNA or RNA strand.

**20 Claims, 16 Drawing Sheets**

